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THE AURORA OF MARCH 7

TO THE EDITOR OF SCIENCE: as a matter of record it may be worth while, even at this late date, to note that the aurora of March 7 was seen in Winter Park, Florida (latitude about $28^{\circ} 37'$). It was visible for a short time only, between 9:30 and 10:00, Central Standard time. Those who saw it described the sky as brilliantly red for perhaps forty degrees along the northern horizon, with streamers extending half way to the zenith.

FRANK P. WHITMAN

WINTER PARK, FLA.,
April 5, 1918

SCIENTIFIC BOOKS

Principes de Géométrie Analytique. Par GASTON DARBOUX. Gauthier-Villars et Cie 1917. Pp. vi + 517.

This important work has elements of interest extending beyond the circle of the professional mathematicians. It was the last mathematical contribution of one of the most noted French scientists and constituted the subject matter of his last course of lectures at the Sorbonne, closing a very successful teaching career which extended over a period of more than fifty years.

The principles of analytic geometry treated in this work relate mainly to the imaginary and the infinite in algebraic geometry, and hence they are also of great philosophic interest. In his Introduction the author states that these principles are too much neglected at the present time, being usually treated in the elementary courses where they can not be developed with the completeness which they merit and which he is free to give them here.

In our American text-books these principles are commonly omitted altogether. Comparatively few students become familiar with such interesting properties as those exhibited, for instance, by the two lines whose equation in rectangular coordinates is $x^2 + y^2 = 0$. Each of these two lines is perpendicular to itself and has the property that the distance between any two of its points corresponding to finite coordinates is zero.

Our students of analytic geometry meet such equations as $x^2 + y^2 + 1 = 0$, which are not satisfied by the coordinates of any real point. They are usually told that these equations represent imaginary curves, but if they consult some more advanced works; *e. g.*, the *Encyclopédie des Sciences Mathématiques* tome III., volume 3, page 260, they find that what they commonly called imaginary circles and imaginary ellipses in their courses in analytic geometry are here called *real* curves. A *real* curve being one whose equation has real coefficients and hence does not need to contain any real point according to these authorities.

These remarks may serve to exhibit the facts that the imaginary in analytic geometry presents views which are quite different from those obtained by the student who confines himself to the consideration of real points, and that authorities do not agree as regards the definition of a real curve when the degree of the curve exceeds unity. Moreover, it is only necessary to recall the two circular points at infinity, which lie on all the circles of the plane, in order to remind ourselves of the fact that infinity also presents matters of interest which escape those who deal only with the finite region.

The volume under review is divided into five books with the following headings: anharmonic ratio, metric definitions, the theorems of Poncelet, Cayleyan geometry, and inversion. It has much in common with a work published by the same author under the title: "Sur une classe remarquable de courbes et de surfaces," 1872, but it contains many later developments. In particular, the part on Cayleyan geometry was developed by the author, according to the preface, during the years 1895 and 1896.

The book is not intended for the beginner in analytic geometry but presupposes some knowledge of this subject. Its chief aim seems to be to lay a solid foundation for the study of the imaginary and the infinite in geometry, and to present the subject in an attractive and simple manner with a view

to securing a wider interest in this extensive field. No other man could have brought a wider knowledge or a more skillful hand to this noble task and the accomplished work is a credit to its author and to his country.

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Additional Studies in the Pleistocene at Vero, Florida. Pages 17-82, 141-143, from the Ninth Annual Report of the Florida State Geological Survey, 1917.

The pamphlet, just arrived, comprises five articles of particular interest to anthropologists: one by Professor E. W. Berry, of Johns Hopkins University, on Fossil Plants; one by Dr. R. W. Schufeldt on Fossil Birds; one by Dr. O. P. Hay, of the Carnegie Institution, on Fossil Vertebrates; and a final paper (with a supplement) by Dr. E. H. Sellards, state geologist of Florida, summing up the evidence and the discussion to date with reference to the antiquity of the associated human remains. The three special papers, it should be noted, are concerned mainly with data from stratum No. 3, *i. e.*, the top formation in and at the base of which most of the human remains occur. Of the organic forms found here those either totally or locally extinct are given approximately as follows: mollusks 0 per cent., turtles 50 per cent., birds 33 per cent., mammals 40 per cent., and plants 20 per cent. Dr. Sellards deems this record consistent and after affirming that the exposed Vero section shows "distinct uninterrupted lines of stratification beneath which human materials are found," pens his conclusions in these words: "The human remains and artifacts are contemporaneous with extinct species of mammals, birds, reptiles, and at least one extinct species of plants, as well as with other animal and plant species that do not at the present time extend their range into Florida. The age of the deposits containing these fossils according to the accepted interpretation of faunas and floras is Pleistocene."

The full significance of these remarks is of more than ordinary importance. With the findings of specialists in the fields of geology

and paleo-biology no anthropologist will be disposed readily to take issue; and the writer in particular, having spent only a few hours at Vero, is in no position to challenge directly any of the alleged facts; but he ventures, nevertheless, to offer some remarks having general bearing on the situation as now developed.

In the first place, anthropological literature records a score or more of isolated archeological discoveries (Dr. Hay cites some of them) which, because of attending circumstances, have by some been adjudged proofs of extraordinary human antiquity and which thus lend substantial support to the appearances at Vero. Many of these discoveries, like the one before us, are of the *bona fide* sort, requiring no affidavits, and they range from the Tertiary gravels of California to the glacial deposits of New Jersey. Nevertheless, whatever the merits of these data, they have not been generally accepted because their acceptance, in view partly of the known conditions of paleolithic Europe, involved tremendous difficulties in the way of assumptions rather than doing away with them. At the same time it can not be doubted that these very finds have directly inspired many students to the investigation of artificially stratified deposits, both in caverns and elsewhere with a view, if possible, to obtaining supporting evidence that would ultimately result in the credibility of these isolated and questionable discoveries. Now, up to the present time, although this indirect effort has been continued for more than a generation and has ranged geographically from Alaska to Patagonia, nothing satisfactory has come of it. Within the United States alone, both cave and mound deposits have repeatedly been shown to record a considerable range in cultural development, but the associated faunal remains of even the oldest strata have never yielded any but modern species; and this, so far as the published data goes, is true also for the shell mounds of Florida. Under those circumstances no archeologist can be expected to relinquish at once his scepticism concerning the Vero discovery.